BULLETIN

OF THE

AMERICAN GEOGRAPHICAL SOCIETY

Vol. XLIII 1911 No. 11

NORTHEASTERN CHEHKIANG, CHINA: NOTES ON HUMAN ADAPTATION TO ENVIRONMENT*

BY

THOMAS GOODCHILD
Church Missionary Society, Hangchow (Hunan)

GENERAL FEATURES. (Cf. map, Fig. 1.) Northeastern Chehkiang [Chekiang], a coastal portion of China, south of the mouth of the Yangtze River, is a district of subdued ranges and hills of irregular trends, which has been slightly submerged, thus producing a swarm of islands; and since then its inner waters have been converted into low plains and its landward islands bound together by the alluvial deposits of the Yangtze and other rivers, while the still detached outer islands, known as the Chusan Archipelago, have been cliffed by the sea.

BOUNDARIES. The district has fairly well defined limits. It is roughly rectangular, about 100 miles from east to west, by 50 miles from north to south. It is adjoined on the east and along a third of its northern coast, as far west as the mouth of the Ningpo River, by the Chusan Archipelago. West of the Ningpo River, as the shore bends around a northward salient, the sea narrows into Hangchow Bay. On the west the district is bounded by the north flowing Dzao-ngo [Yenki] River, on the south by the mountainous district of Sing-ts'ông [Sinchang], Dzing-yün and Vong-hwô [Feng-hwa].

* Although not in consonance with the standard system adopted by the Chinese Imperial Post Office the author's rendering of Chinese names has been retained throughout. It is based on local usage and not on the Mandarin, or official, dialect. Wherever possible, however, equivalents have been added in brackets.—ASST. ED.

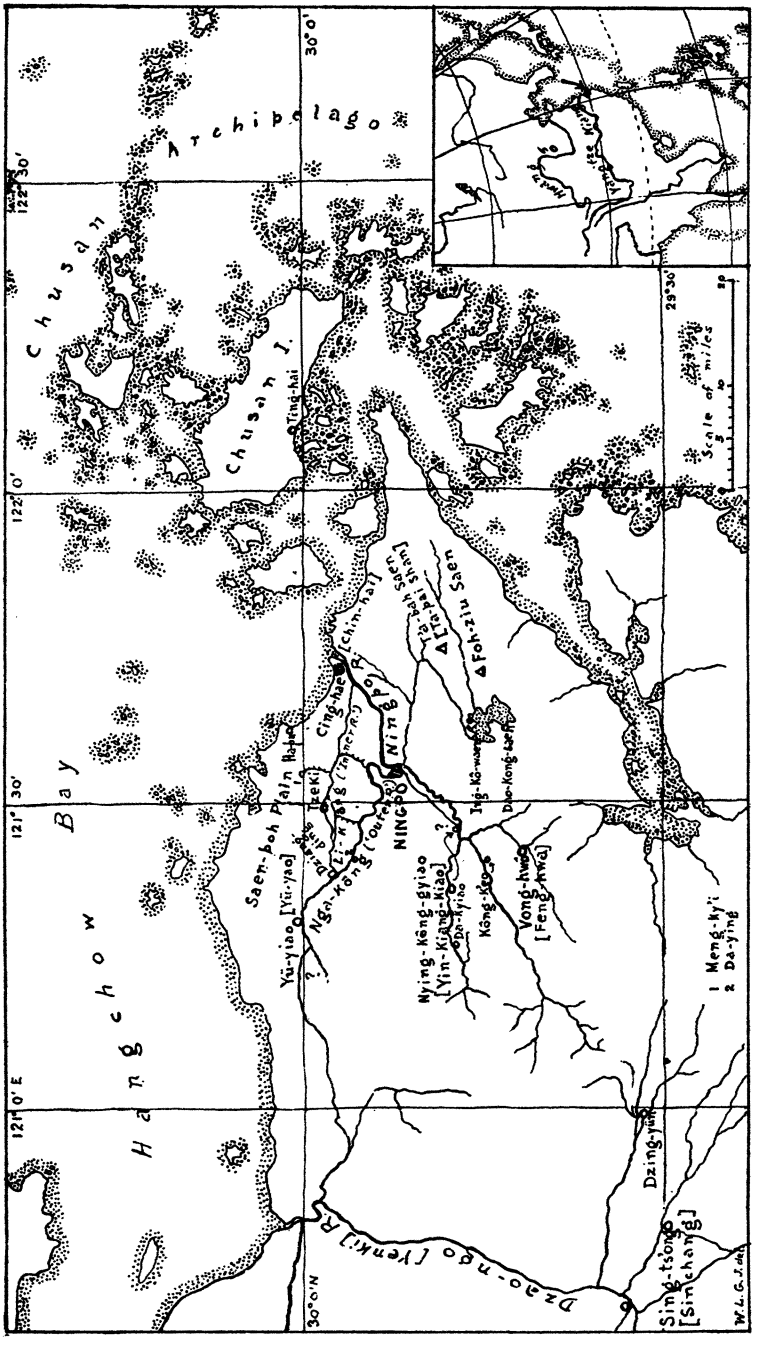

FIG. 1—Sketch Map of Northeastern Chehkiang, China. Scale 1:1,160,000 (1 in. = 18.31 miles). Based mainly on the Karte von Ost-China, 1:1,000,000, published by the Prussian General Staff (1901-02); and, in part, on a map drawn by the author. Arrow on inset-map indicates general location of main map. Compiled by W. L. G. J.

MOUNTAINS, PLAINS AND RIVERS. The city of Ningpo lies on a large alluvial plain northeast of the center of the district, at the junction of large streams from the west and southwest whose united waters, forming the Ningpo River, flow northeastward and have the city of Cing-hae [Chin-hai] at their mouth. North of Ningpo and west of Cing-hae, there is the beginning of a range of hills on the coast. This narrow range varies in height up to about 1,500 ft. It continues in almost a straight line due west, broken only by a gap through which the western branch of the Ningpo River runs eastward. There the range turns southward till it is lost in a spur of the mountains of the interior. North of this range, bounded by the sea on the north and northeast and by the Dzao-ngo River on the west, is an alluvial plain called Saen-poh (=North of the Hills). South of the range is the Ningpo Plain. The latter is about 25 miles* in diameter, with the city of Ningpo near its center. It is the heart of the district.

East of the Ningpo Plain, toward the sea, there are again hills, which rise in the northeast to the peak of T'a-bah Saen [Ta-pai Shan] and, in the east, Foh-ziu Saen. These are about 2,000 feet high. They extend northeastward in a slender promontory. East of these hills the country is drained by small streams running directly to the sea; but most of the interior is drained by the Ningpo River. Its southern branch rises in the Vong-hwô hills and runs toward the northeast; the western branch (the Nga-kông [Yau-kiang]) rises in the canal system of the northern plain near the Dzao-ngo River† and flows east-southeast. These two branches join just outside of the Ningpo city walls. The Dzao-ngo, which bounds the district on the west, rises in the hills of Dzing-yün and Sing-t'sông and runs in a northerly direction to Hangchow Bay.

THE PLAINS. It is evident, as stated above, that the plains of this district have been built up among former islands by silt brought down from the interior of China by the great river Yangtze and possibly to some extent by the Dzien-dang [Tsien-tang], near the mouth of which lies Hangchow. The southern mouth of the Yangtze opens in a southeasterly direction, giving a tendency to its waters to drift toward Ningpo. The water of Hangchow Bay and of the sea far beyond the islands is yellow and muddy, similar to that of the mouth of the Yangtze.

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* *li?* (9 miles approx.).—ASST. ED.

† This is not in accordance with the Karte von Ost-China (see legend of Fig. 1) on which the western branch of the Ningpo River is delineated as a watercourse connecting the lower Dzao-ngo with the Ningpo at the city of that name, thus making an island of the entire district lying north of it.—ASST. ED.

The plains are literally level. The hills rise so abruptly from the plain that in many cases it would be possible to stand astride the line separating them, with one foot on the unquestionable hill slope and the other on the flat alluvium. Canals on the same level as the rivers often follow near the base of the hills. These canals receive the streams from the hills, yet their waters are quite clear, much more so than that of the flood tide that enters the large rivers from the sea.

Proofs that the action of silting is still going on are numerous. In Saen-poh (the northern plain) there are two villages at the foot of the narrow northern range, one called Tong-bu-deo (=Eastern Landing Stage), the other Si-bu-deo (=Western Landing Stage). The former of these is now about 10 miles* from the sea, the latter 14 or 15 miles†. Similarly, the name of the great city of Shanghai in Kiangsu Province means "On the Sea," but it is now inland. Some of the nearest islands in the Chusan Archipelago may be reached by wading at low water. The seashore is commonly a mud flat. At intervals the inhabitants have raised embankments to reclaim ground from the sea. This is known to have been going on for centuries. During the last six or seven years, at the large fishing village of Ha-pu, at the eastern end of the narrow northern range, the mud flat has been banked up and canals dug out, making an efficient harbor for the fishermen's boats.

THE COAST AND THE SEA. The coast of the plains is low, flat and muddy; but where the hills reach the sea, as well as on the exposed sides of the outlying islands the coast is bold and rocky. The low coast of the plain lends itself very readily to the making of salt. Patches of mud flat are fenced in by embankments, so as to control the inflow of the tide. The sea water then passes in by rather irregular channels, in which most of the mud in suspension settles. It is then allowed to flow over the flat, where it evaporates. After a time a crust of salt forms. This is carefully scraped off and made into a strong muddy brine. The brine is filtered through straw in very primitive filters. It is then again evaporated on shallow wooden trays, and the coarse salt is scraped into baskets.

The sea abounds in fish and other marine animals. Among others may be mentioned several varieties of herring, pomfret and marine eels, together with dog fish, small soles, cuttle fish, clams, prawns, crabs, etc. The fishermen of Ningpo, *i. e.* of the whole Ningpo district, are noted for many miles along the coast for their

* *li* ? (3 miles approx.).—ASST. ED.

† *li* ? (5 miles approx.).—ASST. ED.

skill. Their boats are made with primitive water-tight compartments. (It is said that the idea of water-tight compartments in modern steamships was first suggested by these boats.) In the summer they keep their fish fresh with ice and send them to the markets of Shanghai and Ningpo by frequent boats. At other times the fish are salted down, with salt procured in the islands, but made on the mainland. The empty shells of a small variety of clams are collected in the islands by boat-loads. These are taken to Ningpo and burnt for lime. A species of sea moss is gathered from rocky shores and eaten by the people. This is one of the numerous auxiliary foods, which the natives eat with their rice.

THE ISLANDS. The largest island in the archipelago is Chusan; it has several plains, three or four miles across, similar to those on the mainland; the sea water around it is muddy. Here the life resembles that about Ningpo: potatoes and other vegetables are produced in abundance; turkeys, geese, fowls and ducks are bred in large numbers. Most of the other islands are small, with few centers of population of more than 300 or 400 inhabitants; some of their people go to the mainland for harvest work, as if their islands were poor and uncultivated. On the outlying islands, cliffed on their exposed coasts, the people are notoriously piratical.

RIVER NAVIGATION. The native boats on the Ningpo River are made with flat bottoms. Shaped in this way they pass over the tidal water with little friction. The larger passenger and freight boats are generally dependent on the wind for their propulsion. When this fails, the boatmen have a large scull at the back, which feathers itself automatically, as it swings backwards and forwards on a pin at the stern. This scull is balanced so exactly that men can work for long periods without tiring. Sculling is not so rapid as sailing with a fair breeze, but as two men, by alternately resting, can keep up sculling for six or eight hours at a time, the distances thus covered are considerable.

Neither scull nor sail is as fast as the tide in the river when it is in full flow, the tidal range being five or six feet. For this reason almost all traveling on the river is done with a favorable tide. One of the most remarkable cases of adaptation in the district is found in connection with the Nga-kông, or western branch of the Ningpo, also called the "Outer River." The city of Yü-yiao [Yü-yao] is about 40 [25?] miles up this branch. This is too long a distance to travel on two tides, unless the wind is favorable.

About two-thirds of the distance to Yü-yiao at a place called Dziang-ding [Chang-ting], a tributary called the Li-kông, or "Inner River," bends back on the north side of the Nga-kông at an acute angle, so that the tributary flows about west. How much of the tributary is natural and adapted and how much is purely artifical, there are no means of knowing. About half way between Ningpo and Dziang-ding a small canal has been made, connecting the tributary with the Nga-kông. Entrance to this is by a *pô,* or haul-over, a Chinese substitute for a lock. Now, a boat leaving Ningpo on the westward flood tide up the Nga-kông finds itself near the haul-over by the time the tide is exhausted. The boat is then drawn over into the canal, which it follows to the tributary, in which it soon finds that the ebb tide is making a favorable current westward. By the time the boat reaches the tributary mouth, the tide has begun to rise again, and advantage can once more be taken of the flood current up the Nga-kông to reach Yü-yiao.

Connecting the Inner River with the Outer River there are two or three other cross canals. The first of these branches off from the Outer River about four miles from Ningpo. For about six months in the year the tide runs in and out of this at will, but in the spring the entrance is blocked up by an embankment. All boats passing in must then cross the haul-over. When this entrance is closed, the only connection with the tidal water is by way of the Inner River at Dziang-ding, a distance of 40 [20?] miles or more. After the first spring rains all the salt water is flushed out of this canal, and fresh water useful for irrigation takes its place. In hot dry summers, as the fresh water in the upper reaches of the river and in the Inner River is used up for irrigation and by its own evaporation, the salt water from the sea gradually passes up the Outer River till it sometimes reaches Dziang-ding. By blocking up its entrance the water in this canal is thus at least kept fresh for the whole of the irrigation season.

A bridge of boats crosses the Ningpo River from outside the Ling-gyiao Gate of Ningpo city to the east bank of the river, and another bridge of boats passes from outside the East Gate to the Foreign Settlement on the north bank. At other places the river is crossed by ferries. Smaller streams are crossed by bridges, some of which have fine arches, twenty or thirty feet above the water. The arches are reached by steps, such as one sees in Chinese pictures.

River Fishing. Advantage is taken of the tides and muddy water in the river to catch fish. Large pocket nets are held in place

by anchored boats. The fish blindly flow into them in the opaque water and are caught in large numbers.

Farther up the river another method of catching fish is used in several places. Pieces of bamboo are chosen long enough to reach to the bottom of the river and to rise one or more feet above the surface. Stones are tied tightly to these near the lower ends. They are then sunk and pushed into the mud. The pulsation of the water with the weight of the stones tends to drive the bamboos deeper, but the stones act as stops, so that they remain firmly anchored. As passing boats push these aside, their weight at the bottom and floating power at the top soon put them into position again. They are placed at intervals of two or three feet, so as to form a diagonal fence across the river. The fish, passing blindly along in the muddy water, are frightened by the vibration of the bamboos. In their endeavors to pass the barrier they swim along it to the side of the river, where they find a large square pull net rising and falling at intervals to catch them.

In many places along the banks of the river there are large stretches of reeds (*Phragmites*). These serve a double purpose. While growing they help to protect the banks of the river from encroachment by the flow of the tidal water. When cut they are made into the well-known reed sun blinds, with which verandas and many other places are protected from the blazing heat of the summer sun.

LAKES. There are several small lakes at the bases of the hills. These are generally held in by artificial embankments. They are useful as reservoirs for the canals. The most remarkable of them is situated about ten miles southeast of Ningpo City. There an irregular line of hills was found to almost enclose a large piece of the plain. Centuries ago some man with an engineering turn of mind saw the possibilities of the place. Six or seven pieces of dike were built, in all about a mile in length. The result has been the formation of a very shallow but exquisitely beautiful lake, standing about five feet above the plain. It is almost completely surrounded by hills, which rise at the highest to Foh-ziu Saen, referred to above. It is about six miles long and abounds in bays on every side, except along the straight dikes. The Chinese do not appreciate its beauty. This splendid body of water forms a reservoir to feed the canal system over a large area.

OFF-SHORE FISHERMEN. Curiously enough this lake is the home of the off-shore fishermen. They are a fine, hardy set of men with

a rough life full of hardship. Their fishing grounds are among the outer islands of the archipelago, where they go during the winter season of northwest winds, from October to May. Their rendezvous, when setting out, is in a large harbor in one of the outer islands, where thousands of pairs of boats, each carrying from seven to ten men, are gathered. In the summer, their large boats are drawn by manual labor up into the canals across the haul-overs, and from there into the higher water of the lake. Here during the summer months the boats are hauled ashore and repaired. The large villages of Dao-kong-saen, with a population of about 18,000, and Ing-kô-waen, with about 14,000 people, and several other villages on the shores of the lake are almost entirely inhabited by fishermen and their families.

CANALS. Looking on the plains from the top of one of the hills the most remarkable feature of the landscape is the canal system. How much of this has been made by the deepening of runnels of water and how much by direct design, it is difficult to determine. As will be shown later, the fact of a canal being crooked or straight is no guide to its origin.

The canals form a network in every part of the plains. They are the main roads of the district. Every village is placed near a canal. All heavy freight is carried on them by boats, and almost every village sends its one or more passenger boats on them daily, either to Ningpo, or to one of the main centers of population. As there are no wheeled vehicles anywhere in the district, the canal boats are indispensable for general traffic.

Mention has been made of the *pô,* or haulover,* as the Chinese substitute for a lock in passing from one level of water to another. These are built of solid blocks of stone in the form of a very obtuse-angled inverted A. About ten minutes is required for a crossing. In some places, notably on the banks of the Dzao-ngo River, buffaloes are used to haul the boats over, but in most places the work is done by a winch on each side, turned by men. Pieces of mud are cut out of the river side and, after being partly dried, are placed on the blocks of stone to lubricate the passage of the boats. In times of heavy rains or of very high tides, the water washes the mud away and makes the passage over a *pô* very uncomfortable. It is needless to point out that boats drawn over such back-breaking obstacles are subject to a heavy strain, and that only flat-bottomed boats could pass over them.

*Cf. illustration in É. Reclus: *Nouv. Géogr. Univ.*, Vol. VII (L'Asie Orientale), p. 589.—ASST. ED.

Large flocks of ducks are reared on the canals. Some flocks number more than a thousand. They are usually in charge of a "duck-herd" (Fig. 2), who takes them to the duck-house at night, where they lay their eggs. In addition to taking general care of his flock and feeding them, the duck-herd watches for the ducks who lay their eggs during the day: these delinquents are killed and eaten.

FIG. 2—"Duck-herd" with ducks.

FISHING IN THE CANALS. The canals supply a great many fish and other edibles for the Chinese table. Several varieties of carp and bream, eels and marsh tortoises are the most common. A Chinese proverbial expression for fine eating is "Fresh bream and sliced pork dumplings."

Much of the fishing is done by nets. Other methods, however, are employed. The laying of baited hooks to catch some kinds is common. One of the strange sights in the canals is that of catching fish by trained cormorants. These birds sit solemnly on the edge of the boat with rings round their necks to prevent them from swallowing the fish. Suddenly the fisherman begins to shout to them and with a long bamboo brushes them all off into the water. Then a lively scene ensues. The man continues to shout and beat the water with his bamboo, while the birds dive for fish. They come up and endeavor to swallow their prey. When the man sees a bird with a fish half swallowed, he puts his bamboo under it and jerks it up into the boat. There he compels it to disgorge into a basket and then tosses it back into the water. After the birds have finished their work they are fed on the offal and smaller fish.

Dredging the Canals. The natural tendency of the canals is to silt up with mud. The farmer, however, finds that this mud is most useful to help enrich the soil of his fields. The dredger he uses is a very simple one. Two pieces of bamboo tied together in the form of scissors and, at the ends of these poles, two bamboo baskets fitting closely together like a bivalve shell complete his outfit. The thin slush is gathered into boats in the winter. From the boats it is scooped up on the fields near the canals. There it dries in the sun, and in the spring the men cut it up and spread it over the fields.

Another use for this mud is to make bricks and tiles. It is first dried, then moistened to a proper consistency, molded into bricks or tiles, partly dried in the sun and then baked. The gray bricks thus made are very hard and resist the action of the weather for a long time.

A further use is made of this mud as a substitute for mortar in the building of sheds and the poorer class of houses. A good substitute for cement is made of mud, sand and lime. This cement dries slowly, but when it is set, it becomes very hard. The sand comes from the village of Nying-kông-gyiao (mentioned below) in this district and the lime from other hills.

Irrigation. The Chinese are noted everywhere as past masters of the science of irrigation. Nowhere can this be better seen than in northeastern Chehkiang. The use of the canals as reservoirs for irrigating the fields is even greater than for the purpose of transport. In very dry summer weather the water is pumped out on the fields till the canals are emptied. Traffic must then fare as best it can.

As the staple crop on the plains is rice, a constant supply of water is essential. The water is pumped on to the fields by chain pumps made entirely of wood. In some places men use a treadmill to drive the pumps, but more commonly the work is done by the patient ox. This and ploughing are the two principal employments for oxen in the district. For the best rice crops the fields should be kept under two or three inches of water all through the season. To keep this level water must be pumped daily except when there is rain.

Streams in the Hills. The supply of water in the canals in most cases comes partly from mountain streams. Some of these flow with rapids and cascades in ravines; others on pebbly beds in flood plains. Much of the water in these streams is deflected from the main course for irrigation purposes. These subsidiary channels are found near the courses of all these streams, channels that can be drawn from at will.

In some of the larger mountain streams the water is used to turn simple pulp pounding mills, where bamboo is prepared and made into coarse wrapping paper.

One of the largest of these streams enters the canal system at Nying-kông-gyiao [Yin-kiang-kiao], a large market town about 20 [8 or 14?] miles south [S. W.] of Ningpo.* From here to the village of Da-kyiao, a distance of about 10 miles up the stream, boats of very light draft and bamboo rafts are used. The pebbles in the bed of the stream are arranged to form dams at intervals, and the rapids are gathered into narrow channels, thus giving enough depth of water for the boats and bamboo rafts.

THE HILLS. The ridges of many of the hills have very poor soil, composed of half decayed rocks. Outcropping ledges are rare. On some there is a fair growth of grass, but on many of them nothing will grow but stunted pines. On other hills very coarse grass and brushwood may be found. All these are used for firewood. People of western lands will probably be astonished to hear that the Chinese name for the azalea is "firewood flower." Hill sides that are perfect flower gardens of white roses and white, pink and yellow azaleas in the spring, are ruthlessly stripped to supply kitchen fires in the winter.

In the hollows of the hills the soil is better. Here the farmers make terraces for rice fields, and the water of the hill side springs is carefully guided in channels from field to field for irrigation.

In the damp ground at the bases of the hills the soil is used for groves of bamboo. The uses of bamboo will be noticed later.

QUARRIES AND STONE WORK. At Nying-kông-gyiao, at Da-ying, on the western branch of the Ningpo River, and on some of the islands off the coast, there are large stone quarries. The stone is unusually hard and tenacious. The common form of bridge over nearly all canals has a span composed of long slabs of stone. (Fig. 3.) The slabs are nine or ten feet long and only four or five inches thick. They are upheld only at the ends. Only the hardest of stone would bear all its own weight and the weight of heavy loads passing over it.

The foundations of all walls are composed of this stone. The damp, muddy soil within three or four feet of high water level, would soon rot bricks or wood. Chinese houses in northeastern Chehkiang are built so that the heavy tile roofs depend upon the

* On the Karte von Ost-China, 1:1,000,000, it lies about 6 miles farther west than indicated on the author's map.—ASST. ED.

support of wooden posts, the walls being built after the frame and roof have been finished. White ants abound in many places. To prevent their ravages, in all important buildings each post stands on a round stone foundation raised from the floor. In some of the rest-sheds on the sides of the roads each post is composed of one long single stone.

In country places at irregular intervals and in the villages closer together, there are stone landing-steps leading down to the canals

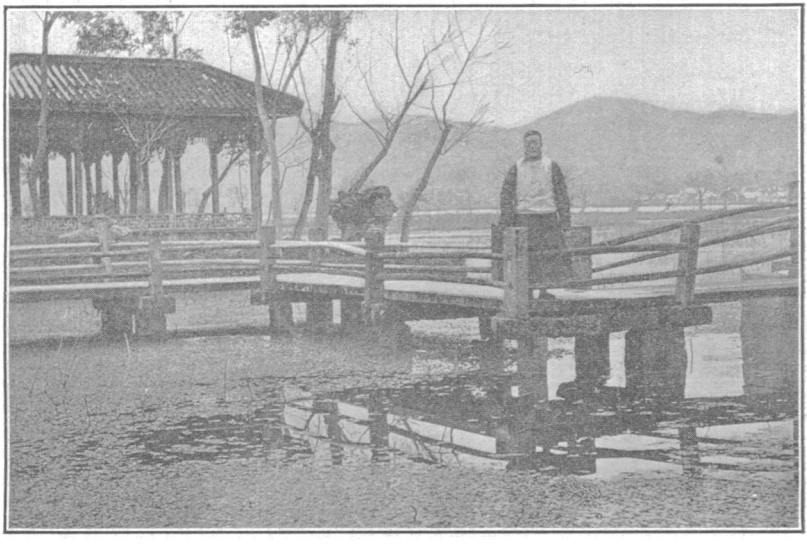

FIG. 3—Bridge showing span composed of long slabs of stone. Si-hu, or West Lake, west of Hangchow, in the background.

where the women wash their clothes, rice and other things. Stone flood gates for use in time of heavy rains are to be found in all the canals.

The city walls of all large cities are built of huge blocks of stone, ten or fifteen feet thick. These are so substantially built that even modern artillery can do very little to destroy them. This was shown in the China-Japan War and in the Boxer Troubles.

All main "dry roads" of any importance are built of stone. In most cases these roads are only four to eight feet wide and are simply composed of slabs of rough stone one to three feet wide in a single row, bordered by bare earth. In addition to the durable nature of the material, a great advantage is gained from the general dryness of the stone slabs. They are always raised up above the

rice fields, and water runs off the stones at once. One disadvantage is that when slightly damp the stones become very slippery. In this the Chinese shoe with a yielding cotton sole is found much more secure to the step than the foreign shoe with raised heel and nails.

Stone is used for building graves. These are all above the level of the ground. In many cases one or two plain slabs of stone are laid as a foundation for the coffin, the sides are built just large enough to contain it, and the roof is made of the same material, with runnels for water, so that the coffin may be kept perfectly dry. Lastly, stone is used for mill stones and for hulling rice. In both these cases the mechanism employed is exceedingly simple, but without illustrations it is difficult to describe it.

Chalk is found in some of the hills and is made into lime, but the best lime for house building is imported from Fu-yang on the Hangchow [Tsien-tang] River. Another use, however, is made of this chalk. It is pounded up very fine and the white powder is used by women as powder for their faces. In a little coarser form it is mixed in with rice to make it white and attractive. For this reason all rice needs to be washed before it is cooked.

Soil of the Plains. The muddy soil of the plains is exceedingly rich. Its depth has never been fathomed. At the city of Shanghai, which is situated on a neighboring plain where the conditions are similar to those of northeastern Chehkiang, borings have been made 500 feet deep, but no rock has been found. If the surface soil is taken off for any purpose, as, for instance, in piling a mound on the top of a grave, a little manure will soon make the stripped surface fruitful. All of the fecal matter of the centers of population is used to fertilize the soil. This is one cause of the unenviable reputation China has for foul smells.

Owing to the general irrigation of the fields and to the narrowness of the roads, there is usually no dust to be raised by the winds. But about once a year there is a "dust storm;" the lower air is usually quiet, but the sky is hazy, and everything becomes covered with dust, the source of which is probably the dry plains of Mongolia.

Reference has been made to the use of mud dredged from the canals in making tiles and bricks. In the village of Kông-k'eo, at the foot of the Vong-hwô hills, there is a large pottery of earth dug near the hill side. At this place huge earthen jars are made capable of containing about a hogshead. These jars are used for collecting rain water, and they may be found in every household. Smaller jars of similar shape are made for various household and other

uses. Wine jars and rough earthen bowls are also made there of the same material.

WATER AND ICE. With the exception of coolies, who sometimes drink water from the canals in their hands, no Chinese drinks anything but hot tea. A doctor once remarked: "The only salvation of the Chinese is that everything they eat and drink is boiled."

In some places, especially along the side of the Ningpo River below the city, there are large ice sheds. The canals seldom freeze, but during the winter the rice fields are flooded, and the ice, a quarter or half an inch thick, is gathered after each sharp frost. This ice is used for keeping fish fresh, especially in hot weather, and for other purposes. It is unnecessary to add that it is quite unsafe to put it into anything which is to be cooled for immediate consumption, as it is loaded with germs of disease.

ANIMALS. The fauna of northeastern Chehkiang is abundant, but in some cases the animals are not put to use as they might be. Oxen are used for the purpose of ploughing, also for turning the chain pumps for irrigation and on some of the haul-overs. A striking feature in many fields is that of ploughing with the patient water buffalo. (Fig. 4.) These huge but mild animals are also used for turning the irrigation pumps, for turning rice hulling and grinding mills and for various other purposes where great strength is needed.

Ponies and donkeys are also to be found in this district, but they are used for carrying persons only. There are no wheeled vehicles, and loads are either carried by boats, or on the shoulders of porters. Dogs and cats are abundant, so also are rats. No attention is paid to the breeding of dogs, and all pups that are born are allowed to live. The result is that the only variety is a medium sized creature with a sharp nose, and as a rule, quite destitute of courage or intelligence. The dogs of a Chinese city are scavengers of the vilest type.

Goats are bred in small numbers and are used as food. The ordinary goat-mutton is a combination of bones and leather. The skin is not stripped from the flesh, but the hair is shaved off. The amount of meat between the bones and skin is exceedingly small, and the taste is poor. Hogs are bred in large numbers, but no care is taken in the selection of the best varieties. The flesh is so generally eaten by the people that the word translated "meat," when used with no qualification, means pork. The skins are cured in such a way as to remain white. Thin boxes are made of camphor

wood, and pigskin is stretched over them. This is the box commonly used for storing clothes. It might be added that pigs are the rivals of dogs as the filthy scavengers of Chinese cities. If the buyers of pork, now sent from China to the London markets, could see the foul creatures whose flesh they are eating, possibly they would choose some other kind of food.

A small variety of deer, resembling a fallow deer, with a white belly and large white spots, is found in the hill districts. The flesh of this is used for food and the skin for various purposes.

In the winter the lakes and larger waterways abound with wild ducks and geese, and on the hill sides there are large numbers of pheasants and wild pigeons. Many of the pheasants and pigeons

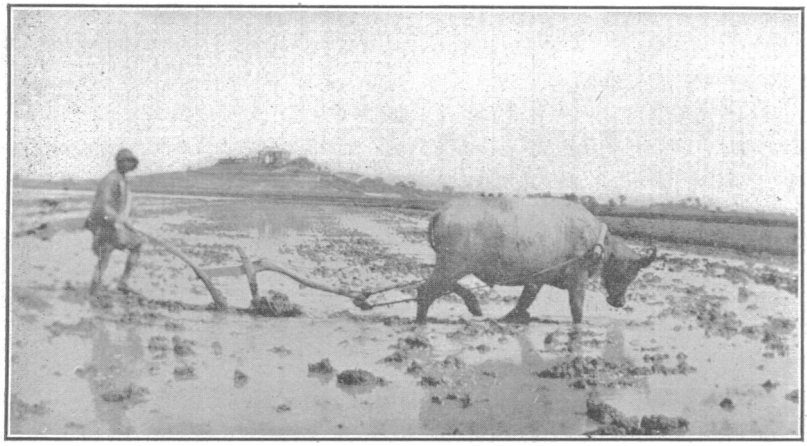

FIG. 4—Ploughing with water buffalo.

are shot and brought to market, but the proverbial shyness of the water birds makes it exceedingly difficult for the Chinese with their primitive firearms to kill them.

Reference has been made to the flocks of tame ducks on the canals and the use made of them. Fowls, too, are bred in large numbers. The true home of the celebrated "Shanghai Fowls" is Lang-shan, on the Yang-tze River, but a similar and equally fine breed is cultivated in the island of Chusan, the largest member of the archipelago off northeastern Chehkiang. Fowls' eggs in the ordinary form are eaten on certain periodical feast days, and the fowls themselves are generally eaten at the New Year season. Fowls' eggs are preserved in a specially prepared mud made of gravel, lime and salt. They are kept in this till the whites take on a

greenish hue. They are then boiled hard and are considered a great delicacy at feasts.

In the swampy fields frogs abound. They are called by the natives "field fowls." The legs of these are eaten as delicacies, but the mandarins do not allow the frogs to be caught till after the rice has passed the bloom, as they are supposed to eat destructive insects.

CROPS. With a semi-tropical climate and rich soil the ground produces abundantly all the year round. On quite a large proportion of the fields two crops a year are regularly raised. Wheat is harvested in June. Early in the year late rice is sown very thickly in small patches, and it comes up like grass in a meadow. As soon as the wheat is harvested, the ground is at once flooded, ploughed and manured, and then the rice, by this time five or six inches high, is planted out by hand in clumps of three or four stalks in even rows. As the stalks are drawn out of the mud, the whole root comes with it, and, when planted again in mud, it revives at once. This crop of late rice is harvested in November. Early rice is alternated with cabbages and late winter vegetables.

The soil and climate are both suited for growing cotton. The plain of Saen-poh is celebrated for this. Cotton wool is used for padding clothes in the cold weather. As it is non-absorbent, these garments are useful in wet weather as waterproofs. It is also used for padding large bed quilts. These are used in the place of mattresses, blankets, sheets and all other bedding. Until the last few years the underclothes of all classes and the outer clothes also of the lower classes were made of cotton. Spinning and weaving have been carried on by the simplest machinery, but native cloth is fast being superseded by that from foreign cotton mills. The shoes with cotton cloth bottoms, referred to above as preventing one's slipping on wet stone roads, absorb moisture and are wet through almost instantly in wet weather. It is worth while mentioning that the native pattern of socks is made with two layers of thin material, and for this reason they are proof against mosquito bites.

Corn, peanuts, sweet potatoes, beans and other crops are grown, also a very poor kind of turnips. Beans are made into bean curd, a favorite dish with the poorer people. Chinese soy, the principal ingredient in various sauces and "relishes," is extracted from beans. Vermicelli, too, is made from bean flour. A cooking oil is extracted from peanuts. Some of the cabbages are partly salted down and left to ferment. This also is a common "flavoring material' for the rice of the lower classes.

In the spring the plains are bright with yellow patches of *yiu-ts'ae,* a kind of rape. The oil made from this is used for all kinds of cooking purposes and for dressing the hair.

Another crop for which the swampy fields are well suited is that of rushes. These are regularly cultivated. They are then in exceedingly primitive looms made into mats. These mats are used to wrap round bedding and in the hot summer weather are very cool to sleep on. Some of the better qualities are dyed and made into the Chinese matting which is so well known in western lands.

In some of the fields a variety of water chestnut (*Eleocharis tuberosus*) is grown. The fruit is rather wooden and tasteless, but large numbers are sold in the streets. Chinese taste differs from that of foreigners from the West.

Indigo is grown in the district and is used for the dyeing of clothes. Blue is by far the commonest color for Chinese clothes.

TEA. On every hill side, where the soil is suitable, tea is cultivated. These precious leaves are grown on small stunted bushes. The Chinese for their own taste simply dry the leaves and, when they make the tea, use boiling, or nearly boiling, water. In preparing what is known as "red tea," the tea which foreigners use, the leaves when half dry are bruised sometimes between the toes of men. Details had better be left untold, lest the taste of China tea should be spoiled to the reader.

TREES. Although China is said to be denuded of her forests, trees form one of the leading features of every landscape in north-eastern Chehkiang. On the hill sides some of these are self-sown, but on the plains and in specially selected spots on the lower hills some care is shown in planting suitable trees. A common variety of soft pine is grown for ordinary timber. Another variety of strongly resinous pine is found to be almost impervious to the ravages of white ants and for this reason is used in better houses.

Magnificent camphor trees in very many places beautify the landscape, especially when the bright young leaves appear in the spring. The native workmen make boxes and furniture of this wood. Clothes packed in camphor wood boxes and drawers are protected from the moth.

A variety of white maple is also grown. This wood has very little grain and is suitable for carving. Ningpo carvers are noted in every part of the world for their beautiful work in this wood. They make photograph frames, boxes, large and small figures, besides large furniture, and ship them everywhere.

The *Chamaerops,* a variety of gomuti palm, flourishes in some parts, especially in the narrow valleys and at the base of the hills. The fiber round the trunk of this tree is non-absorbent of water. The country people use it for making rain-coats. Boatmen and others use it for making ropes, which do not rot with constant immersion so quickly as hempen rope would. The fiber is also used for making mats for the outside covers of Chinese traveling bedding: it is here found to be doubly useful, for, in addition to keeping the bedding dry outdoors, it serves indoors, when spread under the other bedding, as a protection against bed bugs, for these insects will not crawl on it. In a country where the people do not often wash themselves or their clothing, or clean their furniture, such an insulation is an invaluable aid in procuring a night's rest. A thinner cord made from the palm fiber is used, stretched on a frame, to make a slightly yielding bed spring.

In some districts there are large tracts of mulberry trees, grown exclusively for food for silk worms. The quality of the silk produced is not so rich as that made in the Hangchow and Soochow districts, but the industry provides employment for a large number of people.

The inferior growths of all trees are used for firewood. Large quantities of charcoal are made in the hills. As there is no coal within a long distance, the gathering of firewood and the manufacture of charcoal are most important industries.

Although they are not indigenous to northeastern Chehkiang, mention might be made here of two other varieties of trees. One is a very beautiful tree known as the "Maiden Hair Fern Tree," with leaves similar in shape to those of the maiden hair fern. It has been advertised in England by a well-known firm as "no longer indigenous in any part of the world." It grows a little distance west of the district under consideration, in the upper reaches of the Dzien-dang, or Hangchow River, and is one of the commonest trees to be found there.

The other tree grows in the district surrounding the city of Hwei-chow, in the neighboring province of An-hwei. It is that from which the celebrated "Ningpo varnish" is made. The secret of preparation of this varnish is held in a certain clan. As a covering for wood it is unrivaled. The surface is bright and dries extremely hard in damp weather. When it is dry, boiling water does not injure its surface. It thus makes a much better surface for tables than French polish. The Ningpo workmen have made it

famous, as the commonly accepted name shows, although the principal ingredients are produced elsewhere.

With regard to flowering trees mention might be made of a species grown in the district, which is called the *lah-me hwô*. It bears a bright yellow flower in winter, when there are no leaves on the tree. Another tree is called the *kwe hwô*. It is an evergreen and produces flowers in the autumn. These flowers are very fragrant and are much prized by the natives.

The fruit trees are varied, as might be expected in a district which lies between the heat of the tropics and the cooler latitudes of the north. In the neighborhood of the small city of Koh-gyii, which lies under the shelter of the Ningpo promontory, small oranges are grown. In the same place and in many of the narrow valleys between the eastern mountains, the natives grow large numbers of very small oranges, about the size of marbles. These oranges are commonly eaten in their skins. They are used, too, to make delicious preserves.

Pears, plums, apricots, and apricots with flattened ends are also grown in the district. To a visitor from western lands these fruits do not seem to have the same flavor as those common at home, but the natives eat them in large numbers.

A fruit that is much prized by the Chinese is called the *laen-dzô*. This is a sour red fruit about the size of a cherry, a variety of hawthorn (*Crataegus cancata*). It makes a delicious preserve, but the most popular way of preparing it is in the form of a red jelly. This is one of the commonest forms of sweetmeat put upon the table for a casual visitor's refreshment.

Another popular fruit in its season is the Chinese medlar (*Eriobotrya japonica*), called the *bibo,* or in Canton, the *loquat.*

Perhaps the most delicious edible fruit in the district is the *yiang-me,* or tree shrubbery. This is the *Myrica,* a fruit similar to the arbutus. It is very much prized by the natives, and during the season is eaten by all classes of the people.

Another useful, but not edible, fruit is that of the *gyiu-jii,* or tallow tree (*Excoecaria* [*Stillingia*] *sebifera*). Candles are made from the covering of the seed of this tree, and oil, extracted from the seeds by pressure, is used in lamps and for cooking.

Bamboo. Turning from other vegetables and trees to the gigantic grass called "bamboo," we find that it affords the most striking series of adaptations in this district, or in any part of China. The character of the Mongolian Race has been compared to their great

plant, the bamboo; yielding to pressure from without, but returning to its original position as soon as pressure is removed.

Bamboo groves are cultivated with great care. A certain proportion of the growth is removed each year, either in the form of shoots, or as full grown bamboos. These are not removed at random, but in such a way as to encourage the fullest growth on a given piece of ground. Bamboo is difficult to transplant, but when it has once taken root, it will spread in all directions.

In addition to furnishing the plain "stick" of bamboo, it is prepared for use in various ways. One way is to push a long rod through the hollow core and break out all the diaphragms of the nodes, thus making it into a single continuous cylinder. Another is

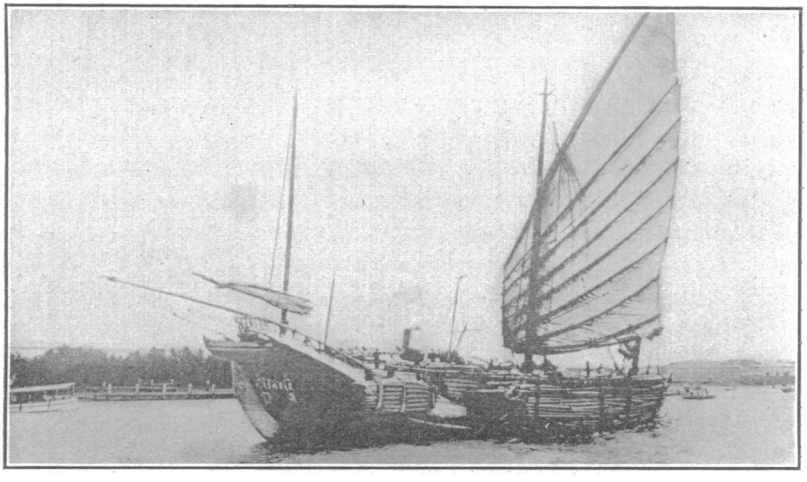

FIG. 5—Chinese junk showing sticks of bamboo used to flatten the sail.

to split it diametrically into sections and, after knocking away the broken parts of the diaphragms, to split the sections parallel to the circumference into strips, called by the Chinese *mih*. The strips vary in width from about three-quarters of an inch downwards, the thickness being about one-eighth of an inch. The outer or surface strips and those next adjoining are very strong and pliable and can be manipulated in numberless ways.

Fishermen and boatmen use the bamboo in every part of their work. In nearly all but the largest boats a heavy bamboo of the *mao-coh* variety is used as a mast. On the sails at intervals of every foot or two sticks of bamboo are fastened to flatten the sail. (Fig. 5.) For this reason the Chinese junk can sail closer to the

wind than any other boat known. The deep-sea fisherman uses pieces of bamboo as floats for his net. A common form of net used on the banks of the canals is square, kept in shape by four pieces of bamboo. Another piece of bamboo is fastened to the middle of this and forms the arm which is raised and lowered by a piece of rope.

In addition to the fish fence used in the tidal river (described above), another form of fish fence is used in the canals. This is made of split bamboo placed so closely that a fish could not pass through. At each fence one or two wide passages gradually grow narrower and wind into an inner enclosed space. This acts as a trap.

On passenger boats the boat hook is made of a long piece of bamboo with a hook at the larger end. The roof or cover of the

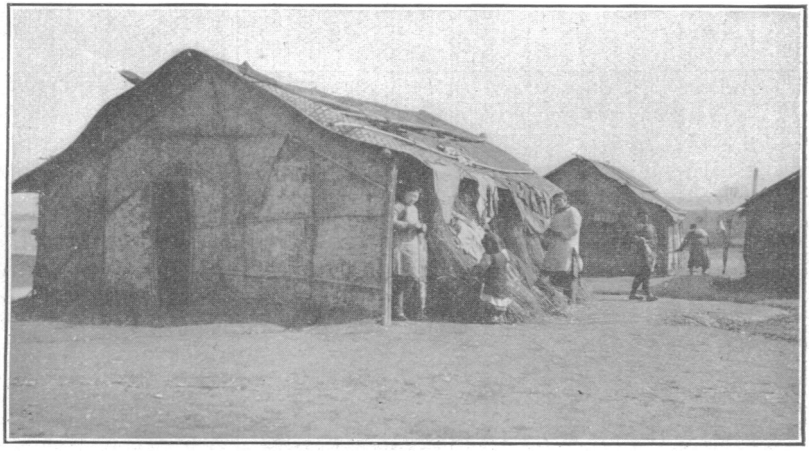

FIG. 6—House made of bamboo matting.

boat is made of bamboo used in three ways. A strong frame is made of heavy bamboo split into about four sections. Two mats are formed of interlaced *mih,* or strips of bamboo, and between these there is a thatch of large leaves taken from a dwarf variety of bamboo. This cover is strong and flexible and can be put up or taken down very easily. (For bamboo similarly used in house-building see Fig. 6.)

The strong rope, which is used to pull the boats over the *pô,* is generally made of the inferior inner strips of *mih.*

The bamboo rafts used on the mountain streams are made of large bamboos laid side by side in one layer. The smaller ends are

scorched over fire and turned up to form the bow of the raft, so that it may glide over stones in the path.

Almost without exception every tradesman adapts bamboo to some purpose or other. The cooper uses twisted split bamboo to bind his tubs and buckets. The carpenter uses large bamboo for roof beams in some small houses. He also uses pins of bamboo in joining together boards to make a smooth surface, and in many places where a Western carpenter would use an iron nail, he uses a bamboo "nail." The farmer uses a bamboo dredger for getting mud out of the canals for his fields. He uses a stick of bamboo for the handle of his digging hoe and rake, and for a light rake used for gathering straw together he has a bamboo stick split at the ends to form the teeth of the rake. Rice is threshed out in the field by hand, and a mat of *mih* protects the flying grain from scattering into the field. To winnow the chaff from the grain it is passed through a bamboo sieve in a place where the wind is blowing. A large mat of *mih* is used for drying the grains of rice, and a similar mat is used for protection from sun and rain in all sorts of places. This kind of mat, covered with tar, is used, too, under the tiles of roofs. If the farmer needs to make a fence anywhere, he makes it of interlaced pieces of split bamboo. The Ningpo version of the New Testament in St. Luke 14.23. reads "You go out on the big roads and by the sides of the bamboo fences and compel them to come in." Every burden bearer or porter uses a piece of bamboo split in half on his shoulder, with the two halves of his load suspended at the ends. The man carrying mud, tiles, bricks and similar things has rough baskets of bamboo strips suspended at the ends of his load carrier. A larger kind of basket made of finer strips of bamboo is used for carrying rice, corn and other cereals. A coarser round basket of longer shape is used for packing charcoal for market. Another of finer strips is used for washing rice for the table in the dirty canals, in fact, baskets of every conceivable shape for every conceivable purpose are made from the useful bamboo. The chair bearer has poles made of large bamboo, and the chair itself, with the exception of the floor and seat, is made exclusively of bamboo. The tailor and the silk and cloth merchants use a foot rule made of bamboo. The shopkeeper wraps up his parcels in bamboo paper and puts what small silver money he gets into a bamboo money box. This money box is a long tube with a sealed bottom. It fits into a groove at the bottom and at the top is held in its place by a lock. In this way it can only be turned upside down by unlocking it, and the size of the cylinder is such that a person's

hands could not be inserted for pilfering. Instead of gutter piping for the eaves of a house a large bamboo, split in halves with the diaphragms of the nodes struck out, makes a good substitute.

For domestic purposes the use of the bamboo is universal. The shoots, as soon as they appear above the ground, are dug out and eaten as a delicate vegetable. The chopsticks, with which the food is eaten, are generally made of bamboo. Kitchen cupboards, used for storing crockery and eatables, chairs, flower vases and hair combs are made of the same material. If a householder finds that the threshold of his door is wearing down, he nails on a strip of heavy bamboo to protect it. The housewife washes her clothes at the side of the canal and then dries them on a long piece of bamboo in place of a clothes line, supporting this substitute for a clothes line on a three-legged bamboo frame. She rocks her baby in a bamboo cradle. She sweeps up the dust with a broom made of bamboo twigs and sweeps it into a dustpan made of bamboo strips. Brushes, the bristles of which are made by splitting the continuation of the bamboo handle, are used for washing cooking pots and scrubbing rough surfaces. Inside the cooking pots a frame of split bamboo is placed, so that a bowl of anything may be heated or steamed by the water or rice underneath. Bamboo scrub is used for firewood. The remarks made about the numerous shapes of baskets used by tradesmen also apply to those used in the household. Bamboo frames are fastened on the beds to support mosquito nets and bamboo shavings are used for stuffing pillows, cushions and sometimes mattresses. The scholar writes with a pen the handle of which is made of bamboo; when he has used the pen he puts it upside down in a bamboo vase; he smokes a pipe made of a tube of bamboo with a small brass bowl, and, if the weather is hot, he uses a fan with a bamboo frame. If he leaves home, he sometimes uses a bamboo box for his clothes. The umbrella he carries in wet weather has a handle made of bamboo, with ribs of split bamboo, and it is covered with oiled bamboo paper. If the housewife goes out in wet weather, she puts on a pair of overshoes made of the husk which encloses the bamboo shoot as it comes out of the ground.

The above list of uses is not exhaustive, but enough has been written to show that the use of bamboo enters into every department of Chinese life. The bamboo is an invaluable possession, and the Chinese thoroughly appreciate it.

Failures of Adaptation. A chapter on adaptation would not

be complete without giving some instances of failures to adapt, or wastes. In view of the care and economy generally shown by the Chinese, some of these failures and wastes are very striking to a Western observer.

On a large proportion of the hill sides the growth of wood is kept down to scrub. The wood cutter only thinks of his present small benefit, not of the value of the timber that might grow for his son.

On some of the hill sides there is an abundant growth of grass. Much of this is coarse, but where it is eaten, it is proved to be nutritive and good. With the exception of a very few goats, no stock is kept to pasture on this grass.

The stagnant water kept exposed in earthen jars forms a fine breeding ground for culex mosquitoes, and the rice fields and swamps are equally well suited for the malaria carrying anopheles mosquito.

SUPERSTITIONS. Many failures to adapt are caused by superstition. When a dog, or cow, or any other animal dies, the corpse would offend the god of the earth if it were buried, so it is thrown into the river or canal to rot away. Last summer rinderpest was raging among the cattle. On the river side at Ningpo the stench arising from these rotting corpses, as they drifted down on the tide, was sometimes too horrible for words. Rice, vegetables and clothes are washed in the canals, sometimes not far from decaying bodies. It is needless to point out how easily diseases of all kinds may be spread abroad. In the autumn cholera travels along these waterways.

A common form of superstition is called *fong-shii,* that is, the "influence of the winds and waters." This superstition shows itself in various ways, the commonest of which are three in number. First, a peculiar configuration of hills near a certain place may bring ill luck. For instance, an imaginary resemblance to a tiger's head and a lion's head on neighboring hills would be bad for places near to each other. The lion and the tiger might quarrel. A second way is to avoid all high buildings except pagodas and temples, which are built to control the *fong-shii.* The third way is to avoid all straight roads and paths. The common reason for this is that evil spirits can only travel in straight, or nearly straight, lines.

This superstition causes many an economic waste, and makes many an adaptation less effective than it would be otherwise. As an illustration of the first, all graves are made above ground, and must be in a place where the spirit of the departed will be comfortable.

The place is chosen by a Professor of *Fong-shii,* who earns his living by encouraging this superstition. The grave may be placed in the middle of a rich field. The platform of the coffin must be raised, and soil must be used for this purpose. Afterwards a huge mound is raised over the coffin, thus often using up the valuable soil of quite a large piece of land. Centuries of graves near large centers of population consume a large proportion of the productive soil.

The advent of western machinery is causing considerable disturbance to the second aspect of *fong-shii.* The unhallowed chimney shaft of a big factory breaks all rules. A few years ago a mint was built in the city of Hangchow, near the official quarter. Soon after it was finished, an old opium-smoking mandarin died from natural causes, or rather, unnatural causes, connected with his vicious habit. The cry was made that the *fong-shii* had been disturbed. The mint was taken down and the tall chimney was moved to another part of the city.

The effect of the third form of this superstition is shown in many ways. The doors of houses in a street are never placed opposite to each other. In some cases where the entrance of a house faces the open fields, a wall is built opposite to it. If a road runs straight alongside a main canal every time a bridge over a branch canal is crossed the bridge is built out into the main canal. To a person walking in the dark this is dangerous. Instead of being made straight, the canals are all more or less crooked. In cases where they are straight for any distance the bridges are sometimes built so low that boatmen are obliged to take down the covers of their boats before they can pass under. In other cases one or two embankments are built out into the canal from alternate sides to destroy the straightness, or a small loop is made with a shrine or a rest house built on the projecting piece of ground. A short canal used to lead directly from the Inner River to a market town called Meng-ky'i, about 15 [9?] miles northwest [N.] of Ningpo. For a time the town was not very prosperous. The inhabitants, therefore, dammed up the direct canal, and now the boatman is obliged to turn off into a branch canal to another town and turn back to regain the main canal, thus adding about two miles to a road, which was originally about half a mile. To a white man this would seem a strange way to help the prosperity of a place. The village of S-kwu-saen, on the side of the Ningpo Lake, has lately shown signs of decay, and the leading members of several families have died. It was decided that the cause of this was the open space of the lake opposite to the village. Although the authorities are very jealous

of any encroachments on the lake, no opposition has been made to the building of a dam opposite the village, for the purpose of regulating the *fong-shui*.

The above will show that most of the failures to adapt on the part of the Chinese in northeastern Chehkiang are caused by ignorance and superstition. The advent of modern education and of machinery, and, still more, the preaching of a religion which is in antagonism to all occult vagaries and superstition, will probably break down these failures and hindrances, so that a visitor fifty years hence may have a story to tell of almost complete adaptation.

HANGING VALLEYS OF THE YOSEMITE

BY

D. W. JOHNSON
Harvard University

TABLE OF CONTENTS:

INTRODUCTION

So much has been written concerning the Yosemite Valley, that another contribution to the subject needs but a short preface. An elaborate description of the region would be out of place, since the salient features of the valley and its hanging tributaries are already familiar to geologists and geographers. Turner ("The Pleistocene Geology of the South-central Sierra Nevada, with especial reference to the origin of Yosemite Valley, 1900") has reviewed the literature relating to this region published prior to 1900, with especial reference to the theories of the origin of the Valley; and has described many of the topographic features in detail. He concludes that the Yosemite Valley was produced by normal stream erosion in extensively jointed rocks. Branner ("A Topographic Feature of